REMARKS

In response to the Office Action mailed December 5, 2003, Applicants respectfully request reconsideration of all rejections in light of the foregoing amendments to the claims, the following remarks and attached request for one-month extension of time to respond.

On November 20, 2003, a telephone conversation with the Examiner regarding a restriction requirement between the invention of claims 17-30 and 1-16 was discussed. A provisional election with traverse to prosecute the method claims 17-30 was made and Applicants are affirming that election and cancelling claims 1-16 without prejudice.

Claims 17-19, 21, 23-25 and 28-30 stand rejected under 35 USC §102(b) as being anticipated by Roba et al. (WO 99/26891). The Examiner submits that Roba discloses an apparatus for cooling hot drawn optical fibers using a flow of cooling gas, the cooling apparatus comprising a series of interconnected modules for through passage and cooling of the drawn fiber and for transversing the flow of cooling gas in alternating directions. Each module is connected to a gas inlet, a gas flow regulator and a mass flow regulator. Gas is collected from each module and sent through a valve to a regeneration unit comprising a purification apparatus. Two buffer units designated 502 and 503 are positioned at the top and bottom ends of the cooling apparatus to isolate the cooling gas from ambient air. These buffer units may also be incorporated into the cooling apparatus and comprise inlets and outlets for the passage of a buffer gas which may be the a different gas or the same as the cooling gas.

Applicants contend that their invention as claimed in claim 17 is not anticipated by the disclosure of Roba et al. Applicants' invention is a method of cooling a hot drawn fiber in a heat exchange unit comprising a single heat exchanger having one fiber inlet end opening, one fiber outlet end opening, at least one cooling gas inlet, gas pumping means and a gas assembly having at least one inlet and at least one outlet comprising the steps of drawing the fiber through the heat exchanger, introducing gaseous coolant into the heat exchanger via the at least one cooling gas inlet collecting the cooling gas

in the cap assembly and withdrawing a gaseous exhaust stream comprising the gaseous coolant and at least one gaseous impurity from the cap assembly by means of the gas pumping means.

The cap assembly comprises a fiber inlet end with an opening in its center, fiber outlet end with an opening in its center, side walls with port means to allow gas to flow through the side walls and connecting means with an opening in its center which allows the cap assembly to be attached to the heat exchanger. The fiber inlet end, the fiber outlet end and side walls form a hollow chamber and the cap is generally shaped and sized to be removable from the heat exchanger. However, it may also be an integral part of the heat exchanger. The cap assembly may be mounted to the top or the bottom of the heat exchanger or the top and bottom of the heat exchanger. The cap assembly during operation of the optical fiber production will act to collect the cooling gas which is typically helium and to minimize entrance of contaminant gases into the fiber optic production process. The collection of the cooling gas can result in the collection of any gaseous impurities that may have entered the heat exchanger as well. The helium in either its pure form or contaminated form may be removed from the cap assembly where it has been collected and directed to a purification and recycling unit or straight into the recycling unit for entry back into the heat exchanger.

The end assemblies that Roba et al. teaches beginning page 15, lines 31-35 through to page 16, lines 1-31, are buffer units which mount on the top and bottom of the cooling tube in the fiber optic production process. Roba et al. teach these buffer units act as curtains in the sense that a buffer gas stream flowing in alternate directions in the two chambers of the buffer units stops substantially the flow of helium or other coolant gas from the cooling tube. By providing the flow of buffer gas, the buffer units will block the helium gas which naturally rises through the optical fiber cooling tube during production of the optical fiber. However, these assemblies at both top and bottom of the cooling tube as taught in Roba et al. are not collection means but are designed to stop the flow of helium out of the cooling tube thereby minimizing both loss of helium and ingress of contaminant gases.

Accordingly, each and every element of Applicants' claimed invention are not present in Roba et al. because the buffer units as taught in Roba et al. do not provide the collection of cooling gas nor the means whereby the cooling gas is exhausted either in pure form or with an impurity present therein from the hot drawn fiber production process. Roba et al. Does not identically disclose Applicants' invention nor do the buffer units teach or suggest Applicants' end caps. Since each and every element of Applicants' claimed invention is not present in Roba et al., this reference does not anticipate the invention as claimed. Reconsideration and reversal of this rejection are respectfully requested.

Claims 17-30 stand rejected under 35 USC §103(a) as being unpatentable over Darcangelo et al. (EP 0 079 186) in view of Ji et al. (US Patent No. 6,125,638). The Examiner submits that Darcangelo et al. teaches a process and apparatus for drawing an optical fiber comprising a cylindrical coolant tube provided with end caps for supplying and withdrawing helium cooling gas to and from the cooling tube of a controlled flow rate. The Examiner contends that the cooling apparatus of Darcangelo et al. accomplishes the claimed method steps of claim 17 of drawing a fiber through a heat exchanger having a cap assembly, introducing cooling gas to the heat exchanger via a gas inlet and withdrawing gas from the heat exchanger from a top end cap. However, Darcangelo et al. does not expressly disclose how the helium is removed and recovered from the top end cap, thus does not teach withdrawing gas and a gaseous impurity from the cap assembly by a gas pumping means.

Ji et al. teaches a method of cooling a hot drawn optical fiber comprising withdrawing helium cooling gas and a gaseous impurity from a heat exchanger by means of a variable speed blower. Ji et al. also teaches that air usually infiltrates a fiber cooling system and that in systems establishing positive pressure in the heat exchanger suffer the disadvantage of losing cooling gas through the fiber openings in the heat exchanger. As such, it would have been obvious to one skilled in the art to use the helium purification, a system of Ji et al. with the apparatus of Darcangelo et al. for the purposes of recovering and recycling the expensive cooling gas from the upper end cap with a minimal loss of helium to the atmosphere.

Applicants contend that their invention as claimed in claim 17 is not an obvious variation over that taught by the combination of Darcangelo et al. in view of Ji et al. Darcangelo et al. teaches a fiber cooling process utilizing a cooling tube which may have an end cap on the bottom and an end cap on the top, the bottom to supply coolant gas through and the top thereby to exhaust gas. Both of these end caps contain iris diaphragms by which the end opening of the cooling tube assembly may be adjusted such that by changing the diameter at the top and bottom of each iris diaphragm control of the flow of cooling gas is established. The end caps as they are taught in Darcangelo et al. are not designed to collect the cooling gas but are merely acting as the top and bottom of the fiber optic cooling tube and are adjustable via the iris diaphragm to coordinate and adjust the flow of cooling gas through the cooling tube. The recovery of the cooling gas occurs through slot 48, manifold 46 and exhaust orifice 72 as noted in Fig. 2 of Darcangelo et al.

Ji et al. teaches a cooling process for optical fibers utilizing a variable speed gas pumping means to withdraw coolant from the heat exchanger. The variable speed gas pumping means is employed to control the flow of coolant in a manner such that a minimal loss of cooling gas occurs while the cooling tube is at partial vacuum. By adjusting the flow rate of the gas withdrawn from the cooling tube, a steady state may be established thereby improving the efficiency of the cooling as well as limiting cooling gas loss to the atmosphere. However, recovery of this gas is within the cooling tube assembly and absent the pressure applied by the variable speed gas pumping means, the cooling gas would flow directly out of the end of the heat exchanger.

Applicants submit that there would be no incentive to one of ordinary skill in the art to look to the process of Darcangelo et al. to combine it with the variable speed pumping means of Ji et al. to arrive at Applicants' invention. Applicants' invention is directed to a method of cooling a hot drawn fiber in a heat exchange unit utilizing the introduction of a gaseous coolant into the heat exchanger and collecting this cooling gas in a cap assembly whereby the cooling gas and a gaseous impurity within the coolant gas may be removed by gas pumping means from the cap assembly. Both the purpose

of the end caps of Darcangelo et al. and the variable speed gas pumping means of Ji et al. is to control the flow of coolant gas through the heat exchanger or cooling tube used in the fiber draw process. Neither teaches that an end cap assembly may be employed to collect the coolant gas and a gaseous impurity and remove said cooling gas and gaseous impurity to be sent to a purification unit whereby the coolant gas is recovered and recycled for use in the hot fiber draw process. Given that there is no teaching nor suggestion to combine these two references to teach to control the flow rate of coolant gas, the method of cooling a hot drawn fiber wherein a cooling gas is collected in a cap assembly is not obvious. Accordingly, Applicants submit that the combination of Darcangelo et al. and Ji et al. does not teach the invention of claim 17 as now claimed. Reconsideration and reversal of this rejection are respectfully requested.

The references made of record but not applied have not been discussed as they are considered less relevant than that art relied upon.

For these reasons, Applicants submit that their invention as claimed define patentable subject matter and is in condition for allowance. Prompt favorable action to that end is respectfully solicited.

The Examiner is invited to call the undersigned should any question arise during the reconsideration of the subject application.

Respectfully submitted,

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Enclosure
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